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SARI®, COMPUTER SOFTWARE FOR SECTIONING AND ASSESSMENT REMOTE IMAGES FOR PRECISION AGRICULTURE STRATEGIES

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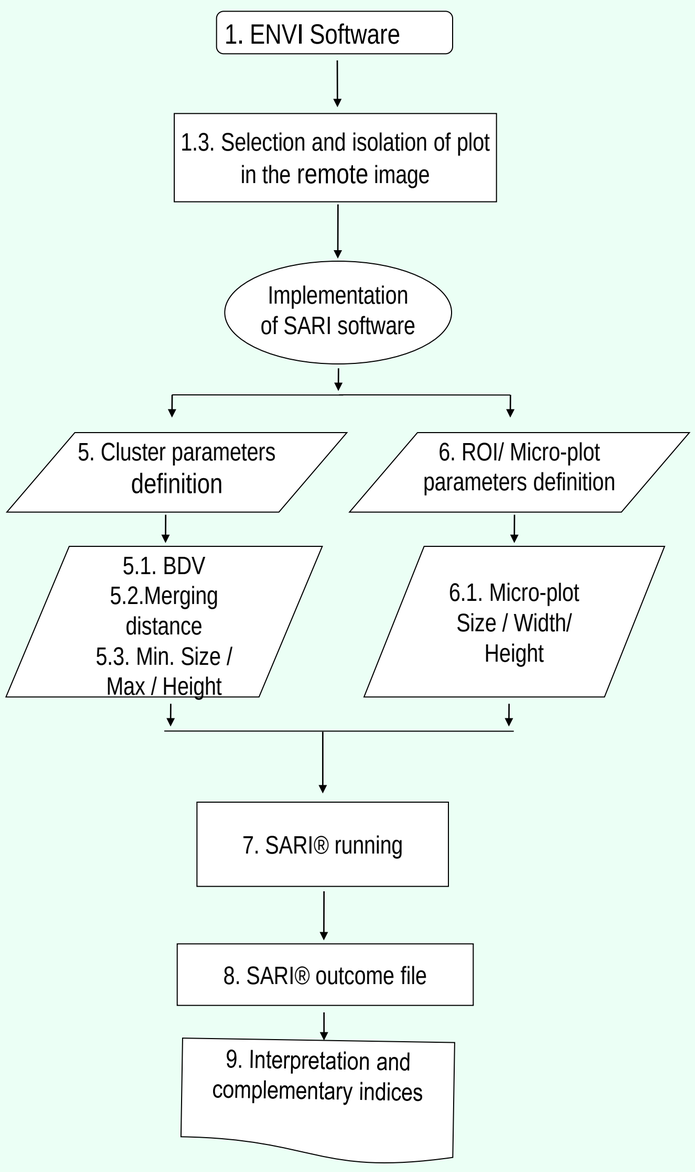
1. INTRODUCTION

The software named Sectioning and Assessment of Remote Images® (SARI®) has been developed to implement precision agriculture strategies through remote sensing imagery. The aim of this work is to briefly describe the accomplishment of SARI® software in the site-specific management of a peas (*Pisum sativum* L.) field partly infested by *Orobanche crenata* Forsk. through remotely sensed imagery.

2. THE SARI® SOFTWARE

ENVI® was the computer program used for visualizing and processing images; this is written in IDL®, a systematized computer language which permits integrated image processes. SARI® is written in IDL®, works as an add-on of ENVI®, and has been developed to implement precision agriculture strategies (García-Torres *et al.*, 2008a & 2008b). Any waveband or vegetation index image in which the land uses can be discriminated is suitable for being processed by SARI®, as will be shown in this paper. First, a supervised classification of the main land uses in the plot image selected is needed, defining the boundary digital values (BDV) of each mentioned land use and its statistical accuracy. The BDV of the selected land uses, among other parameters, will then be SARI® software-implemented.

3. OPERACIONAL FLOWCHART®



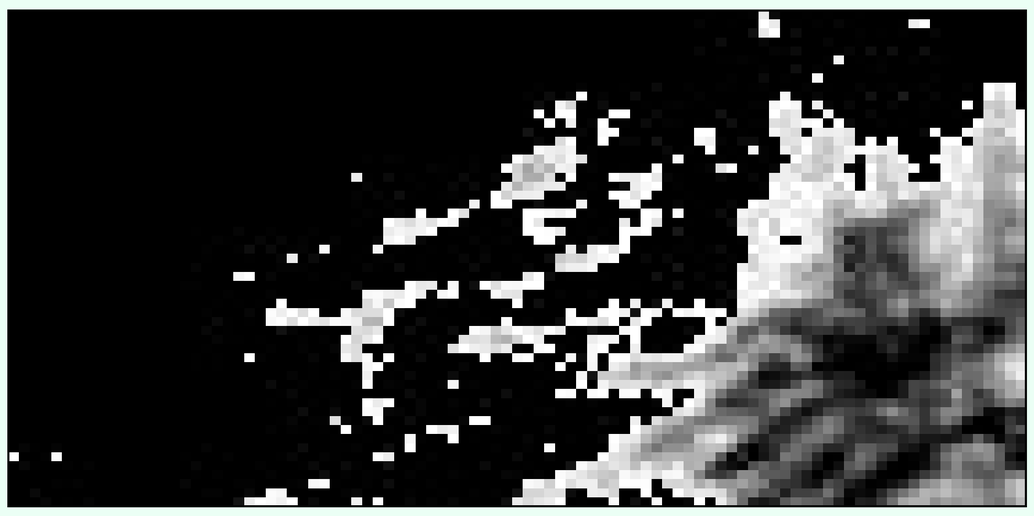
4. CASE STUDY: SITE-SPECIFIC MANAGEMENT OF A PEA'S FIELD INFESTED BY OROBANCHE

A multispectral remote image (Blue/ B, Green/G, Red/R, and Near-Infrared/NIR) was taken from an airplane at 1500 m above the soil surface at 26 April 2006 at Montalban (Cordoba, southern Spain. Pixel size was 1 × 1 m. This image included a field of peas (*Pisum sativum* L.) of 0.7 ha (X = 311807, Y = 4161192). This pea's field was partly infested by the pathogen/ parasitic weed broomrape (*Orobanche crenata* Forsk.). In the date when the image was taken *Orobanche*-free crop was at an advanced fruiting stage and still completely green; while the *Orobanche*-infested crop patches showed the parasite *Orobanche* plants emerged from the soil surface and the crop plants exhibiting an anticipated senescence stage, colour brown-yellow. The vegetation index NDVI (NIR-R/ NIR+R) image was used to discriminate *Orobanche*-free and *Orobanche*–infested areas through a supervised classification process. This was based on geo-referenced (DGPS) *Orobanche*-free and -infested ground data carried out one day before the aerial image was taken.

SARI® software was used to section the Orobanche-infested area (NDVI, VDF 0 to 0,619) image (Figure 1) into micro-images/ micro-plot of 19 m x 10 m, determining the percentage of infested pixels for each micro-plot. The herbicide prescription map was achieved with the criteria of applying herbicide where infested pixels in each micro-plot were over >25% (classes 2 to 5 as arbitrarily defined by SARI ®).

a)

b)



c)

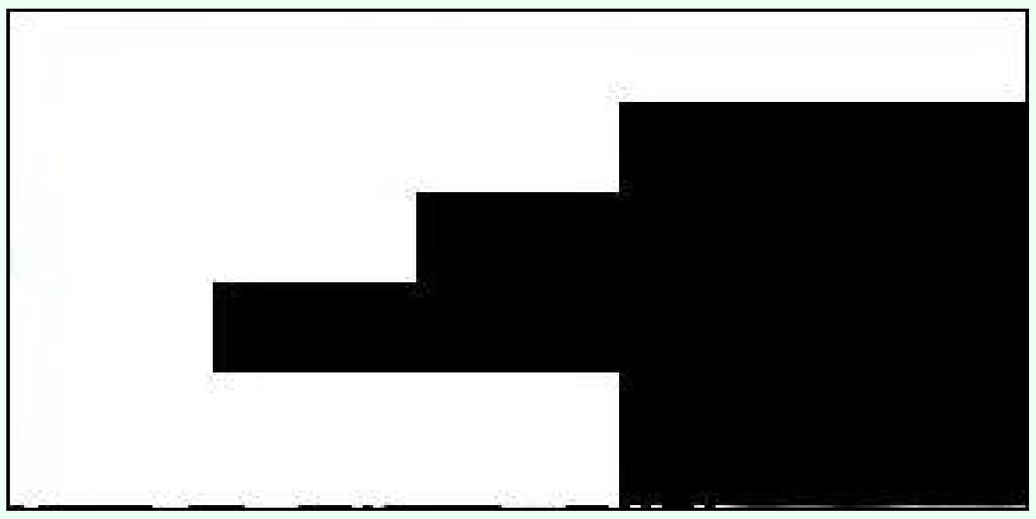


Figure 1: a) NDVI image: white and dark area is *Orobanche*-free (DV 0.62/0.74) and *Orobanche*-infested (DV 0.21/0.62, respectively; b) the same field shown only the isolated *Orobanche* patches (DV 0-0.62, grey and light dark area); and c) Prescription herbicide map achieved through SARI; micro-plot of 19 x 10 m; herbicide application criteria: over 25% infested pixels in each micro-plot.

In addition, SARI® software can work with any biotic factors and/or non-biotic factor that can be discriminated in the remote image. Moreover, the parameters characterizing the biotic/ non-biotic factor, such as the boundaries digital values and the distance and size of aggregates, can be implemented by SARI® in a very flexible way.

5. CONCLUSION

SARI® is effective software sectionalizing plot images and assessing key agro-environmental characteristic of each micro-plot, regardless of the size of the original plot image and of the micro-images.

6. REFERENCES

Garcia-Torres et. al., 2008a. *Registration of Intellectual Property*, Regional Department of Culture, Seville, Spain, No. 200899900226820, pp. 39.

Garcia-Torres et. al., 2008b. *Spanish Office for Patents and Trademarks*, Madrid, 08 June 2008, P200801932, & PCT/ ES2009 /070247.